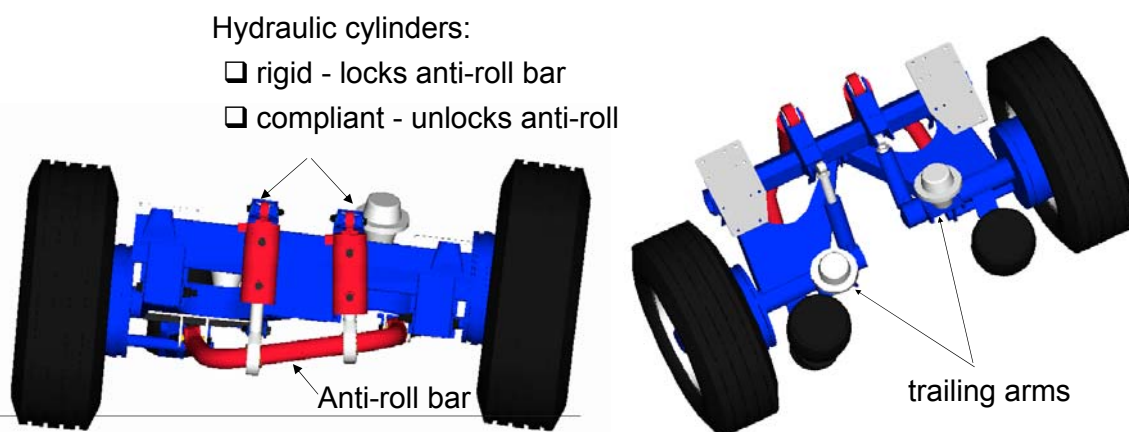


## INTRODUCTION

The roll-ride trade-off is a fundamental conflict of vehicle dynamics:

- stiff suspension  $\Rightarrow$  less roll, worse ride
- soft suspension  $\Rightarrow$  more roll, better ride

Large amounts of roll in a heavy vehicle results in lateral displacement of the center of gravity towards the outside of a corner. This leads to roll over at lower levels of lateral acceleration.



## THE SYSTEM

Semi-active roll control involves changing the roll stiffness of the vehicle:

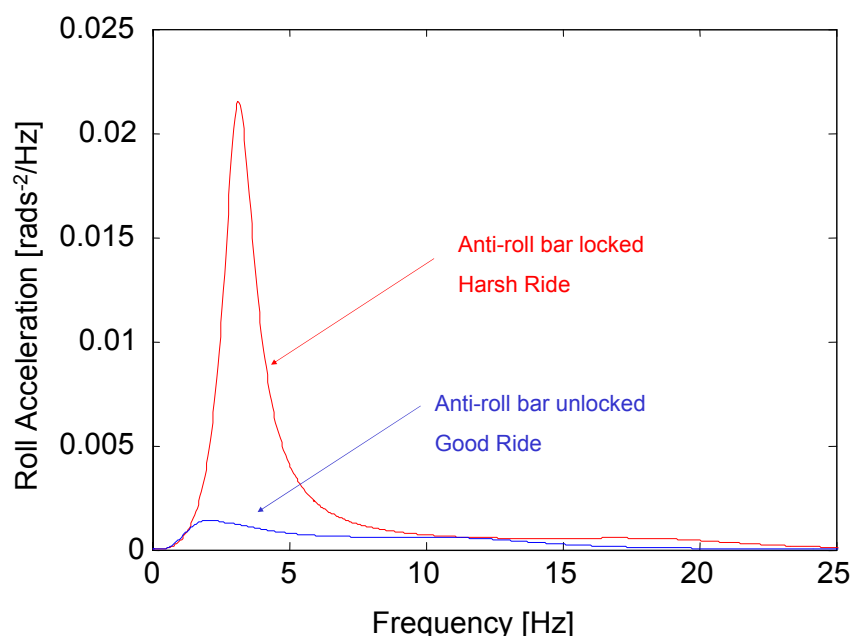
- soft (unlocked) during general driving
- stiff (locked) during cornering

This is achieved by connecting and disconnecting an anti-roll bar on an independent trailing arm suspension using hydraulic cylinders.

## RIDE PERFORMANCE

During normal driving the anti-roll bar is unlocked:

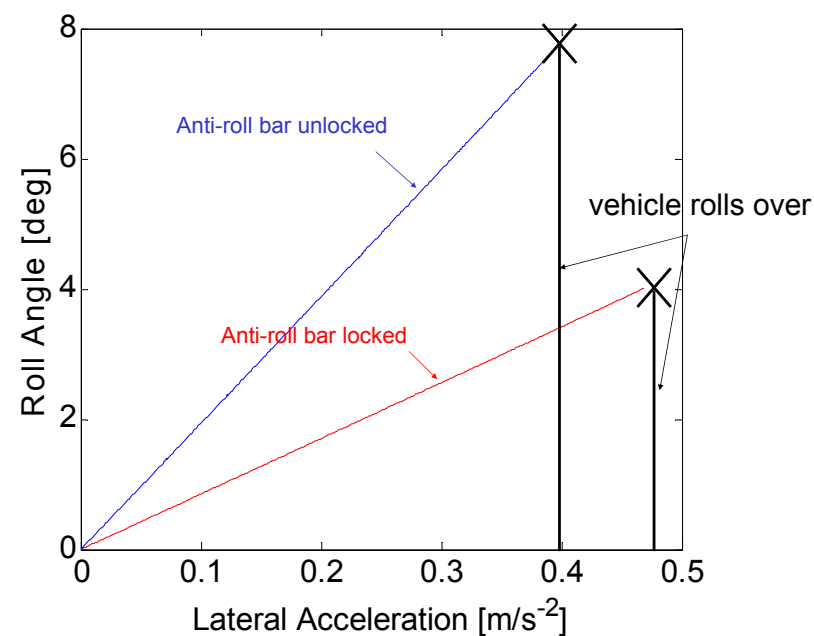
- less vibrations are transmitted to the vehicle body
- the forces at the tyre road interface are reduced
- road damage is reduced
- RMS roll accelerations are reduced by 50%



## ROLL PERFORMANCE

During cornering the anti-roll bar is locked:

- locking reduces roll angle
- this means less load is transferred from the inside wheel to the outside wheel.
- this increase the lateral acceleration at which the vehicle rolls over



## CONTROL STRATEGY

The rollover threshold of the vehicle can be increased further by allowing some roll angle to be locked in. If the vehicle performs a gentle right hand bend followed by a sharp right hand bend (e.g. exiting a roundabout), the vehicle is allowed to roll during the gentle bend and the roll angle locked in.

To do this, the future path of the vehicle must be known. This can be predicted by:

- using a GPS
- monitoring the steer angle

This is the subject of the current research.



## Cambridge Vehicle Dynamics Consortium

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